Fermilab is Ready for the Next-Generation Internet

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If you have been in the field long enough to remember the DECNET-to-IP transition, you may be less than excited by the thought of the next change in network protocols. But the fact is, this transition has been quietly taking place for ten years.

Internet Protocol version 6, or IPv6, the successor to the current IPv4, is already supported by common operating systems, including Linux, Windows, MacOS, and Solaris. It is also supported by the software on Fermilab's Cisco routers, as well as the ESNET and Abilene network backbones.

If all the pieces are in place then why isn't IPv6 in common use already? With the shortage of a routable IPv4 address for each computer on the Internet, the urgency certainly exists. Address sharing through a mechanism known as "NAT" has been forced on home users, as well as on computer clusters in some US physics departments, and entire organizations elsewhere in the world. When the nuisance factor of such workarounds as NAT reaches a critical level, an organization “flips the switch” on IPv6.

With its 128-bit addresses supplanting IPv4's 32-bit addresses, anywhere a shared IPv4 address used to be found, a full subnet, or even an entire network is possible! But until each organization’s peer sites and the intervening networks enable IPv6, the transition will depend on translation devices between the IPv6 networks and the IPv4 world.

The US government has mandated that all its agency networks support IPv6 by 2008. The ESNET backbone became one of the first government organizations to adopt IPv6, creating the “6bone,” or IPv6 testing backbone, in 1996, which expanded to include 32 countries within two years. Fermilab also participated in early tests and the development of the IPv6 standards documents. The latest fruit of that participation has been RFC 4620, "IPv6 Node Information Queries." The protocol defined in that document helps the operation of “low-infrastructure” networks and reduces the need for hand-entry of those lengthy addresses used by IPv6.